Fabric-Based Wearable Acousto-Electric Generation System for Harvesting of Wind Energy

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Introduction

Low-temperature conditions and a need for constant mobility for military field units can make recharging radio batteries impractical as this requires that an electrical generator be unpackaged and activated. Electrical generators are large and emit electromagnetism which can betray the location of operational units.

Thus, the ability to power small radios as well as drone-control electronics even under cold conditions and to recharge batteries without the use of conventional electrical generators is critical. Under conditions of extreme cold, it becomes more practical to generate current continually rather than trying to redesign batteries to function at increasingly lower temperatures.

Abstract

The most readily-available energy resource in latitudes north of the Arctic Circle is wind energy. I propose that this energy can be most efficiently harvested, particularly in a military context, by converting the sound generated by wind interacting with materials including clothing and the fabric of which tents are composed into electrical energy.

Ferromagnetic Elastomers alternatingly weaved alongside thin cuprate-based conductive wires can be incorporated into fabric-based or Gore-Tex-based materials. Ferromagnetic elastomers were first mentioned by this author in 2022 in the context of designing miniaturized listening devices (ibid..)

The Ferromagnetic Elastomer would be a polymer of a flexible nature doped with ferromagnetic materials which are magnetically polarized so that one half of a strand of the fabric would be polarized as “North” and so that the Norths uniformly face toward the cuprate strands, which run in parallel. By this, this author means, to be clear, magnetizing the strands width-wise rather than length-wise. To put it another way, if this is visualized as guitar strings, every other guitar string would be a thin copper wire and every other string would be a flexible magnetized elastomer in which the portion of the circumference of the elastic strings neighboring the copper wires would be “North” and the opposite side would be “South” and there would be only two strings in each set with each pair being separated by some space from the next pairing of ferro-elastomer and cuprate wires.

Acoustic energy from any source, but particularly the high-pitched whistle generated by wind whipping through fabric can be; through the use of such structures; converted into electrical energy. A simple alligator-clip can be attached to any portion of worn attire or the fabric of a pup tent composed of such materials which connects to a wire which is plugged into the piece of

electronics being utilized at a given time. Any motion in the fabric, including that caused by flexion as a result of walking would also cause the material to generate current.

Conclusion

Although the quantity of electricity generated would be modest, novel transmission protocols and efficient electronics could be powered by such limited amounts of electrical energy.